

## CLAIMS

- 1     1.     A method for a coordinated bringup of a repaired storage appliance in a storage  
2     appliance cluster, the repaired storage appliance having a disk subsystem, the method  
3     comprising the steps of:  
4         asserting a GIVEWAIT state in a predetermined memory location of the repaired  
5     storage appliance;  
6         releasing disk reservations in response to detection of the asserted GIVEWAIT  
7     state by a surviving storage appliance;  
8         initializing the disk subsystem of the repaired storage appliance;  
9         asserting a MBWAIT state in the predetermined memory location; and  
10        performing a giveback operation by the surviving storage appliance in response to  
11     detecting the MBWAIT state.
- 1     2.     The method of claim 1 further comprising the steps of:  
2         completing the repaired storage appliance initialization; and  
3         processing data access requests by the repaired storage appliance.
- 1     3.     The method of claim 1 wherein the predetermined memory location comprises a  
2     state data structure within a memory of the repaired storage appliance.
- 1     4.     The method of claim 1 wherein the surviving storage appliance detects the  
2     GIVEWAIT state by performing a remote direct memory access read operation to the  
3     predetermined memory location.
- 1     5.     The method of claim 1 wherein the surviving storage appliance detects the  
2     MBWAIT state by performing a remote direct memory access operation of the predeter-  
3     mined memory location.

1     6.     The method of claim 1 wherein the surviving storage appliance ceases to process  
2     data access requests directed to the repaired storage appliance after performing the give-  
3     back operation.

1     7.     A storage appliance for use in a storage system cluster, the storage appliance  
2     comprising:

3             a storage operating system having a cluster failover layer adapted to perform a  
4     coordinated bringup operation in association with a partner storage appliance, wherein  
5     the coordinated bringup operation comprises the steps of:

6             (i) asserting a first state in a predetermined memory location of the storage  
7     appliance;

8             (ii) initializing a disk subsystem of the repaired storage appliance in re-  
9     sponse to detecting a release of disk reservations by a partner storage appliance;

10            (iii) asserting a second state in the predetermined memory location;

11            (iv) processing data access requests directed to the storage appliance after  
12     a giveback operation performed by the partner storage appliance; and

13            whereby a period of time during which clients of the storage system are without  
14     connectivity is minimized.

1     8.     The storage appliance of claim 6 wherein the cluster failover layer is further  
2     adapted to perform routine remote direct and memory access read operations to the part-  
3     ner storage appliance to detect a state of the partner storage appliance.

1     9.     The storage appliance of claim 8 wherein the second state comprises a MBWAIT  
2     state.

1     10.    The storage appliance of claim 8 wherein the first state comprises a GIVEWAIT  
2     state.

- 1 11. A method for a coordinated bringup of a repaired storage appliance in a storage  
2 appliance cluster, the repaired storage appliance having a disk subsystem, the method  
3 comprising the steps of:  
4 asserting a first state in a predetermined memory location of the repaired storage  
5 appliance;  
6 releasing disk reservations in response to detection of the asserted first state by a  
7 surviving storage appliance;  
8 initializing the disk subsystem of the repaired storage appliance;  
9 asserting a second state in the predetermined memory location; and  
10 performing a giveback operation by the surviving storage appliance in response to  
11 detecting the second state.  
12
- 1 12. The method of claim 11 wherein the predetermined memory location comprises a  
2 state data structure within a memory of the repaired storage appliance.
- 1 13. The method of claim 11 wherein the surviving storage appliance detects the first  
2 state by performing a remote direct memory access read operation to the predetermined  
3 memory location.
- 1 14. The method of claim 11 wherein the surviving storage appliance detects the sec-  
2 ond state by performing a remote direct memory access operation of the predetermined  
3 memory location.
- 1 15. The method of claim 11 wherein the surviving storage appliance ceases to process  
2 data access requests directed to the repaired storage appliance after performing the give-  
3 back operation.
- 1 16. The method of claim 11 wherein the first state comprises a GIVEWAIT state.

1 17. The method of claim 11 wherein the second state comprises a MBWAIT state.

1 18. The method of claim 11 wherein the set of disk reservations comprises small  
2 computer systems interface reservations.

1 19. A computer readable medium, including program instructions executing on a  
2 storage appliance, for a coordinated bringup of a repaired storage appliance in a storage  
3 appliance cluster, the repaired storage appliance having a disk subsystem, the computer  
4 readable medium including instructions for performing the steps of:

5 asserting a GIVEWAIT state in a predetermined memory location of the repaired  
6 storage appliance;

7 releasing disk reservations in response to detection of the asserted GIVEWAIT  
8 state by a surviving storage appliance;

9 initializing the disk subsystem of the repaired storage appliance;

10 asserting a MBWAIT state in the predetermined memory location; and

11 performing a giveback operation by the surviving storage appliance in response to  
12 detecting the MBWAIT state.

1 20. The computer readable medium of claim 19 further comprising the steps of:

2 completing the repaired storage appliance initialization; and

3 processing data access requests by the repaired storage appliance.

1 21. The computer readable medium of claim 19 wherein the predetermined memory  
2 location comprises a state data structure within a memory of the repaired storage appli-  
3 ance.

1 22. The computer readable medium of claim 19 wherein the surviving storage appli-  
2 ance detects the GIVEWAIT state by performing a remote direct memory access read  
3 operation to the predetermined memory location.

- 1   23.    The computer readable medium of claim 19 wherein the surviving storage appli-  
2   ance detects the MBWAIT state by performing a remote direct memory access operation  
3   of the predetermined memory location.

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